REMARKS / ARGUMENTS

1. Status of Application

Assignee filed a request for continued examination on January 16, 2009. This non-final action is the first action on this continuing application. Prior to this paper, all pending claims had been rejected.

2. *Dayco / McKesson* Disclosure

In accordance the undersigned's current understanding of the obligations imposed by *Dayco Products, Inc. v. Total Containment, Inc.*, 329 F.3d 1358 (Fed. Cir. 2003) and *McKesson Information Solutions, Inc. v. Bridge Medical, Inc.*, 487 F.3d 897 (Fed. Cir. 2007), the following co-pending application(s) whose file history may contain material information are identified. In assessing the patentability of the pending claims, the Office is respectfully requested to review the file history of each the listed co-pending application(s), determine whether such co-pending application has "similar subject matter" and, if so, consider each Office Action, including each reference on which a rejection is based, and each paper submitted by applicant therein.

a. Application serial no. 11/164,187, filed on November 14, 2005 and entitled *Integrated Heat Exchanges In A Rack For Vertical Board Style Computer Systems*, issued on May 6, 2008 as US 7,367,384.

b. Application serial no. 12/052,599, filed on March 20, 2008 and entitled *Integrated Heat Exchanges In A Rack For Vertical Board Style Computer Systems*, as a continuing application of serial no. 11/164,187. A preliminary amendment was filed on June 2, 2008. The TSS review is complete for this application.

c. Application serial no. 11/308,267 filed on March 14, 2006 and entitled *Method and Apparatus for Cooling Electronic Enclosures*, is pending before Examiner Ciric and received an advisory action on September 29, 2009 refusing entry of an after final amendment filed on September 21, 2009.

d. Application serial no. 11/458,732 filed on July 20, 2006 and entitled *Electronic Equipment Cabinet with Integrated, High Capacity, Cooling System, and Backup Ventilation*, is pending before Examiner Bauer. A response to a Non-Final Action was filed on May 14, 2009 and a notice of non-compliance was mailed on September 17,

2009.

e. Application serial no. 10/904,889, filed on December 2, 2004 and entitled *Cooling System for High Density Heat Load*, is currently pending before Examiner Rahim. A response to a Non-Final Rejection was filed on June 12, 2009.

3. Prior Arguments and Amendments

As the Examiner will see below, Assignee has attempted to streamline the claim sets in this continuing application to place the application as a whole in better condition for allowance. To this end, and in light of *Hakim v. Canon Avent Group PLC*, 479 F.3d 313, 81 U.S.P.Q.2d (BNA) 1900 (Fed. Cir. 2007) and similar cases, Assignee hereby retracts and expressly disavows all arguments and amendments concerning all pending, canceled and withdrawn claims and all cited art made prior to this paper in all related pending and expired applications.

4. Response to April 16, 2009 Non-Final Office Action

For the convenience of the Examiner and clarity of purpose, Assignee has reprinted the substance of the Office Action in ***bolded and italicized font***. Assignee's arguments immediately follow in regular font.

2. The objection to claims 80-84 have been withdrawn in view of the amendments thereto.

Assignee thanks the Examiner for the favorable treatment given the prior amendments to claims 80 – 84.

> ***3. Claim 83 is objected to because of the following informalities: Claim 83 recites, "the second working fluid" which lacks antecedent basis. It appears it should be changed to read, "the working fluid". For the purposes of examination the limitation will be considered as suggested above. Appropriate correction is required.***

Claim 83 has been amended by deleting the "the second working fluid" recitation.

> ***4. Claims 1, 7-13, 22-23, 26, 28-29, 32-34, 36-40, 43, 51, 57, 60-61, 72-84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (US 6,305,180 - hereinafter, "Miller") in view of James et al. (US 4,756,161 - hereinafter, "James").***

As a threshold matter, Assignee understands the reference to "James et al." to be to U.S. Patent No. 4,756,164.

To place this continuing application in better condition for examination and allowance, Assignee has canceled "apparatus" claim set 1 (i.e., claims 1, 4, 7-13, 22-24, 74) in favor of "apparatus claim set 26 (i.e., claims 26-29, 32-40, 42, 43, 75). Similarly, Assignee has canceled "method" claim set 51 (i.e., claims 51-53, 76), method claim set 57 (i.e., claims 57-61, 77, 78), and method claim set 72 (i.e., claims 72 and 73) in favor of "method" claim set 79 (i.e., claims 79-84). Thus, the amendments herein present two claim sets, one directed to an apparatus (claim set 1) and one directed to a method (claim set 79), for consideration by the Examiner. Clean copies of the two claim sets are included in the Appendix.

> ***With respect to claim 1, Miller teaches a computer system comprising: a chassis (Generally depicted in Fig 2a) having an air inlet and an air outlet; an air mover (6) associated with the chassis and with either the air inlet or the air outlet and establishing a forced air flow path within the chassis; a first computer module compartment (Between respective element***

1b) positioned in the chassis and in the forced air flow path so that heat from the first compartment may be transferred to the forced air flow; a first air-to-fluid heat exchanger (1b) having at least one internal fluid passage (Pipes P) configured to carry a working fluid, and a plurality of heat transfer surfaces (Surfaces of Pipes P) therein, and positioned in the chassis between the air inlet (adjacent the first heat exchanger 1b) and the first compartment in the forced air flow path such that the forced air flows through the heat exchanger and across the heat transfer surfaces and thereby removes a portion of the heat from the air (See Fig 2c which shows cooled air entering the flow path after the first exchanger); a second computer module compartment (Between respective element 1b) positioned in the chassis and in the forced air flow path; a second air-to-fluid heat exchanger (1b) having at least one internal fluid passage (Pipes P) configured to carry the working fluid, and a plurality of heat transfer surfaces (Surfaces of Pipes P, Column 9, Lines 13-19) therein, and positioned in the chassis between the first and second compartments in the forced air flow path such that the forced air flows through th second heat exchanger and across the heat transfer surfaces and thereby removes a portion of the heat from the air (See Fig 2a, see also Column 9, Lines 13-33; also see POA Figs 1 and 2 below), a heat exchanger (40) external to and spaced apart from the chassis and adapted to remove heat from the working fluid; and a controller (45) configured to control the pressure or temperature of the working fluid supplied to the first and second heat exchangers. Miller fails to specifically teach or suggest that the working fluid changes phase within the first (1b) and second (1b) heat exchangers - rather Miller teaches a secondary cooling loop (See Fig 5) which provides cooling fluid to the heat exchangers. However, James teaches the conventionality of using a conventional refrigeration loop system which has a controller (That which controls the inlet valve (27a), expansion valve (26), and compressor (23)) such that it maintains the working fluid in a phase transition within the first heat exchanger (Col 7, Lines 9-14). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of James as per above with that of Miller with the benefit being that James only uses a single refrigeration circuit (Col 3, Lines 5-9). Using a single refrigeration circuit reduces parts and maintenance. Additionally, the Examiner notes that both the system of Miller (where cooling is tapped from a main refrigeration circuit) and James are well known in the art and

> ***interchangeable.***

As indicated above claim set 1 (claims 1, 4, 7-13, 22-24, 74) has been canceled without prejudice. Thus, this rejection has been mooted.

> ***With respect to claim 26, Miller further teaches (In Figs 2a and 5) a system comprising: a chassis (Generally depicted in Fig 2a, defined by each of 1a, 1b, and 2b); an air mover (6, 17a) coupled to the chassis to induce a flow of air along a flow path within the chassis; a first electronics compartment (Adjacent 1b, that which 2a resides) positioned in the chassis and in the air flow path; a first air-to-fluid heat exchanger (1b) positioned in the chassis and in the air flow path, wherein the first heat exchanger includes at least one internal fluid passage (Pipes, P) configured to carry a working fluid that absorbs heat from in the air flow path; and a heat exchanger (43) positioned external to and spaced apart from the chassis (See Fig 5 which suggests that the heat exchanger (43) is separate and apart from the chassis) and in fluid communication with the first heat exchanger, wherein the external heat exchanger is configured to cool the working fluid (Col 10, Lines 33-54); and a controller (50) operably coupled to the system to control the pressure or temperature of the working fluid supplied to the first heat exchanger. Miller fails to specifically teach or suggest that the working fluid changes phase within the first (1b) and second (1b) heat exchangers - rather Miller teaches a secondary cooling loop (See Fig 5) which provides cooling fluid to the heat exchangers. However, James teaches the conventionality of using a conventional refrigeration loop system which has a controller (That which controls the inlet valve (27a), expansion valve (26), and compressor (23)) such that it maintains the working fluid in a phase transition within the first heat exchanger (Col 7, Lines 9-14). Therefore It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of James as per above with that of Miller with the benefit being that James only uses a single refrigeration circuit (Col 3, Lines 5-9). Using a single refrigeration circuit reduces parts and maintenance. Additionally, the Examiner notes that both the system of Miller (where cooling is tapped from a main refrigeration circuit) and James are well known in the art and interchangeable.***

Assignee respectfully traverses the Office's factual conclusions about the cited art and respectfully challenges the Office's legal conclusions that claim 26 is unpatentable over a combination of Miller and James.

Miller Does Not Teach Or Suggest The Invention Of Claim 26

Assignee respectfully submits that, contrary to the Offices' factual conclusions, Miller does not teach or suggest the invention of claim 26 in at least several important respects. First, claim 26, as amended above, requires "a working fluid configured to change state from a first phase to a second phase within at least one of the fluid passages in response to heat in the air flow path." As the Office concedes, Miller fails to teach or suggest that the working fluid changes phase in the evaporator. Miller only teaches the use of ***water*** as a working fluid and it is well known that a chilled water cooling system (like Miller) does not use phase transition to effect cooling. This is a fundamental structural difference between Miller and the invention of claim 26 and, as discussed below, is antithetical to the proposed combination of Miller with James.

Second, Claim 26 requires a "***controller operably coupled to the system and configured to control the temperature of the working fluid supplied to the first heat exchanger above a dew point of the air in the air flow***." Assignee contends that what the Office now labels "controller (45)" is Miller's "control valve (45)." Col. 10, Lines 39-42. Control valve (45) is mentioned only once in all of Miller and its purpose is never expressly stated. At column 10, lines 33 – 54, Miller states (emphasis added):

> Referring to FIG. 5, this shows a system for supplying coolant (i.e. water) to each of the piping arrays which are mounted between adjacent racks. A main refrigeration system 40, (which can be part of the plant in the building that is

> connected to air conditioning equipment) has flow and return pipes 41, 42 connected to a primary heat exchanger 43. Chilled coolant therefore flows in the primary loop from the main system 40 through pipe 41 to one side of the heat exchanger 43 before being returned by pipe 42. ***Pipe 42 includes a control valve 45 and pump 46***. The heat exchanger 43 separates the coolant in the main refrigeration system from a secondary loop containing water which is used as the coolant in the piping arrays P. This secondary loop includes flow pipe 47 connected to the water containing side of a heat exchanger 48 and a return pipe 49 which returns chilled water, via pump 50, to the manifolds connected to the piping arrays P. It is a comparatively simple task to connect heat exchanger 47 to the main refrigeration system for maintaining a constant supply of chilled water with a flow temperature of say 14.degree. C. This chilled water extracts heat from the heated air flowing over the piping arrays P so that the return temperature rises to about 17.degree. C.

Thus, to the extent Miller has a "controller" for control valve (45) the Office has provided no support for its apparent conclusion that such controller is configured "to control ***the temperature of the working fluid*** supplied to the first heat exchanger ***above a dew point of the air in the air flow***" as required by claim 26. At most, Miller supports a conclusion that control valve 45 controls the amount of chilled water flowing to the heat exchangers. There is no teaching or suggestion that control valve 45 can be "controlled" to adjust the temperature of the working fluid supplied to the first heat exchanger. The Office has offered no independent support for this conclusion.

Third, Miller does not teach or suggest the need for an "enclosure" in which the electronic equipment resides, as required by claim 26. Indeed, Miller's system specifically requires an ***open rack with heat exchanger baffle plates*** 15 (See. e.g. Fig. 2b) to direct cooled air back into the room. Thus, the open rack formed between the chilled water heat exchangers (as seen in Fig. 2a) cannot be considered to teach or suggest "an enclosure having a chassis therein and adapted to operatively house heat-producing electronic equipment and defining an air flow path into the enclosure, across the electronic equipment and out of the enclosure," as required by claim 26. In addition, and only to the extent the Office would

consider a "unit 2a" or "2b" to be an enclosure, there is no "first heat exchanger" within such unit.

Thus, Assignee contends that the Office's factual conclusions concerning Miller are not supported by what Miller actually discloses.

James Does Not Teach Or Suggest The Invention Of Claim 26

In contrast to Miller's chilled water system, James discloses a conventional ***vapor compression refrigeration system*** in an unconventional combination with a ***non-powered*** cooling cycle in which heat from a higher temperature region is transferred to a lower temperature region. According to James,

> by interconnecting a cold storage unit and a refrigerated space with an extensive network of vertical heat pipes, the present invention provides a degree of non-powered cooling of the refrigerated space that was not possible in the prior art.

Col. 8, lines 12-17. More visually, James is directed to a refrigerator/freezer combination in which the freezer section (cold storage) is positioned gravitationally above the refrigerator section. During powered operation, the conventional vapor compression system cools both sections. During non-powered operation, heat is transferred between the freezer section and the refrigerator section by the "extensive network of vertical heat pipes." In this non-powered operation, the working fluid is circulated through the cooling loop ***solely by gravity*** (i.e. non-powered operation) and "non-powered cooling can continue until the temperature of the cold plate 28 rises, as a result of the heat transferred from the refrigerated space 29, to the temperature of the refrigerated space 29."

According to James, once the cold plate (freezer) is fully charged (i.e. cooled) by the conventional, powered vapor compression cycle, the compressor 23 is switched off and

expansion valve 27 is left open. Col. 6, Line 52-54. In this non-powered state, and because the freezer is located above the higher temperature refrigerator, gravity causes the working fluid to flow in a liquid state through vertical heat pipes from the freezer, change state to a gas in the warmer refrigerator section and flow up the heat pipes to the freezer section where it condenses back to a liquid and starts the non-powered cycle again (ceasing when the system temperature reaches equilibrium).

In rejecting Claim 26, the Office concludes that James' teaches:

> the conventionality of using a conventional refrigeration loop system which has a controller (that which controls the inlet valve (27a), expansion valve (26), and compressor (23)) such that it [the controller] maintains the working fluid in phase transition within the first heat exchanger. (Col. 7, Line 9-14).

However, beginning at column 6, line 52 through column 8, line 4, James describes his ***non-powered cooling cycle*** and the only non-powered cooling cycle ***control*** disclosed or taught is

> active control of inlet valve 27 or 27a can also be used to either automatically or manually control the ***amount of refrigerant*** admitted from the reservoir [sic, reservoir] 25 in applications where there is more refrigerant in the system than is desired in the heat pipes for nonpowered cooling.

Col. 6, line 66 – Col. 7, line 3 (emphasis added). Thus, just like with Miller, controlling the ***amount or volume*** of working fluid in James' non-powered cooling loop does not teach or suggest controlling "***the pressure or temperature of the working fluid supplied to the first heat exchanger to facilitate phase change of the working fluid within the first heat exchanger***" as required by claim 26. Indeed, James has no such control as evidenced by the teaching that the non-powered cycle stops once temperature equilibrium is reached.

Assignee contends that the Office's factual conclusions concerning what James discloses are not supported by the evidence.

A Miller/James Combination Does Not Teach Or Suggest Every Element of Claim 26

In addition to Assignee's disagreement with the Office's factual conclusions concerning what Miller and James teach, Assignee contends that the Office's legal conclusions based on Miller and James are unfounded as well.

Miller's ***chilled water system*** and James' ***vapor compression/heat pipe system*** are fundamentally and irreconcilably different and incompatible. Miller relies on the temperature and flow rate of the chilled water to accomplish cooling. James, in contrast, relies on flash expansion of a two-phase refrigerant in a gas compression cycle to accomplish primary cooling and heat pipes for secondary cooling. Because of the fundamentally different operating principles between chilled water systems and vapor compression/heat pipe systems, there would have been no inherent motivation as of the priority date of the subject application to attempt to combine such disparate systems. The Office is required by the Supreme Court's mandate in *KSR* to articulate a "***rational underpinning***" for its conclusion that a person of ordinary skill would be motivated as of March 2004 to combine the teachings of Miller and James. Assignee contends that the Office has failed to articulate a logical explanation of why a person of ordinary skill, ***without knowing the details of the present application***, would be motivated to attempt combining the disparate teachings of Miller and James.

In similar vein, Assignee challenges the Office's conclusion that the systems of Miller and James are "interchangeable." Assignee respectfully requests that the Office cite to evidence and articulate a rational underpinning supporting this factual conclusion that these systems are interchangeable.

The foregoing shortcomings notwithstanding, even if it were desirable and possible to physically combine Miller with James to produce a functioning system, such combination would

still fail to embody all elements required by claim 26. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966) (holding that the Office may reject a claim as obvious ***only*** when each and every claim limitation is disclosed by a proper combination of prior art references).

Among other things, claim 26 requires a working fluid "***pump located downstream*** of the external heat exchanger." James does not teach or suggest placing a pump downstream of his condenser (24). To the extent the Office considers a vapor compressor (James 23) to be a pump, in James, as in all vapor compression systems, the compressor (23) is located ***upstream*** of the external (i.e., condensing) heat exchanger (24). A compressor (23) placed downstream of a condensing heat exchanger (24) would be quickly destroyed.

Further, as claim 26 is structured, there is no requirement for an expansion valve (James 26), which is required in a vapor compression system, such as James. Rather than flashing all of the working fluid into gas as is done in a vapor compression system, in the invention of claim 26 only that amount of working fluid gas is created in the first heat exchanger as is required to cool the air within the enclosure. That is, in claim 26, the fluid exiting the first heat exchanger may be 100% gas or any mixture of liquid and gas. Claim 26 does not require that the working fluid exiting the first heat exchanger be 100% vapor (as in James) or that any working fluid vapor be compressed prior to entering the external heat exchanger. In claim 26, so long as the ***temperature*** of the working fluid supplied to the first heat exchanger is maintained above the dew point of the air flowing across the heat exchanger, condensation will not occur in the enclosure.

Thus, for at least these reasons, Assignee contends that none of Miller, James or their combination teaches or suggests the invention of claim 26. With the amendments to Claim 26 and the arguments presented herein, Assignee has earnestly attempted to present claim set 26

in a condition that the Examiner can allow. Reconsideration is respectfully requested.

> ***With respect to claim 7, Miller further teaches a third computer module compartment (Where another of 2a is placed) positioned in the chassis and in the air flow path; and a third heat exchanger (Another of 1b) positioned in the chassis and in the air flow path, wherein the third heat exchanger is positioned at least partially downstream of the second computer module compartment and at least partially upstream of the third computer module compartment (See Fig 2a).***

Claim 7 has been canceled without prejudice.

> ***With respect to claims 28, and 32, Miller further teaches a plurality of computer modules (2a) held in the first electronics compartment (See Fig 2a) oriented edgewise with respect to the air flow path.***

Claims 28 and 32 have been amended for reasons unrelated to this rejection. For at least the reasons presented above with respect to independent claim 26, claims 28 and 32 are likewise allowable.

> ***With respect to claims 12, 29, 39, Miller further teaches that the first computer module electronics compartment is configured to hold at least a first computer module oriented edgewise with respect to the air flow path toward a first side of the second heat exchanger, and wherein the second computer module/electronics compartment is configured to hold at least a second computer module oriented edgewise with respect to the air flow path from a second side of the second heat exchanger opposite to the first side of the second heat exchanger (See Fig 2a).***

Claim 12 has been canceled without prejudice. Claims 29 and 39 have been amended for reasons unrelated to this rejection. For at least the reasons presented above with respect to

independent claim 26, claims 29 and 39 are likewise allowable.

> ***With respect to claims 13 and 43, Miller further teaches a first computer module (2a) carried by the first computer module compartment, wherein the first computer module includes at least a first computer processor (Column 8, Lines 28-31, "components"); and a second computer module (Another of 2a) carried by the second computer module compartment, wherein the second computer module includes at least a second computer processor (Column 8, Lines 28-31, "components").***

Claim 13 has been canceled without prejudice. Claim 43 has been amended for reasons unrelated to this rejection. For at least the reasons presented above with respect to independent claim 26, claim 43 is likewise allowable.

> ***With respect to claim 33, Miller further teaches that the chassis has an air inlet and an air outlet (See POA Fig 1 above); and further comprises: a first plurality of computer modules (2a) held in the first electronics compartment at least partially in the air flow path; a second electronics compartment (Between respective element 1b) positioned in the air flow path in the chassis and spaced apart from the first electronics compartment; a second plurality of computer modules (2a) held in the second electronics compartment at least partially in the air flow path; and a second air-to-fluid heat exchanger (1b) positioned in the air flow path in the chassis, wherein the second heat exchanger is positioned at least partially downstream of the first electronics compartment at least partially upstream of the second electronics compartment, and wherein the second heat exchanger includes at least one opening (13) through which the air mover moves air to transfer heat from the air to the fluid (Column 9, Lines 13-33, see also POA Fig 2 above).***
>
> ***With respect to claim 36, Miller further teaches that the air mover (17a) is carried by the chassis (See Figs 2a, where the heat exchanger (1b) carries 17a which in turn is carried by the chassis).***

> ***With respect to claim 37, Miller further teaches a third electronics compartment (Between respective element 1b) positioned in the air flow path in the chassis and spaced apart from the second electronics compartment; a third plurality of computer modules (2a) held in the third electronics compartment at least partially in the air flow path; and a third heat exchanger (1b) positioned in the air flow path in the chassis, wherein the third heat exchanger is positioned at least partially downstream of the second electronics compartment and at least partially upstream of the third electronics compartment, and wherein the third heat exchanger includes at least one opening (13) through which the air mover moves air (See Fig 2a).***
>
> ***With respect to claim 38, Miller further teaches that the electronics compartments (That which 2a resides), and the heat exchangers (1b) are arranged vertically with respect to the chassis (See Fig 2a).***
>
> ***With respect to claim 40, Miller further teaches that each of the first plurality of computer modules (2a) is individually carried by the first electronics compartment (Fig 2a), herein each of the first plurality of computer modules includes at least a first computer processor (Column 8, Lines 28-31 - "components"), wherein each of the second plurality of computer modules (2a) is individually carried by the second electronics compartment (Fig 2a), and wherein each of the second plurality of computer modules includes at least a second computer processor (Column 8, Lines 28-31 - "components").***

Claims 33, 36, 37, 38 and 40 have been amended for reasons unrelated to this rejection. For at least the reasons presented above with respect to independent claim 26, claims 33, 36, 37, 38 and 40 are likewise allowable.

> ***With respect to claim 57, Miller further teaches a method for dissipating heat generated in a chassis (Generally depicted in Fig 2a), comprising: providing a chassis having an air inlet (See POA Fig 1 above), an air outlet (See POA Fig 1 above) and at least one heat-generating object (2a) therein; placing***

an air-to-fluid heat exchanger (l b) in the chassis; moving a working fluid through an internal passage (Pipes, P) of the heat exchanger; moving air (Via 6) through the air inlet and through the heat exchanger to transfer heat from the air to the working fluid; cooling the working fluid in a heat exchanger (43) located outside of and spaced apart from the chassis; controlling the working fluid (Via 50) to maintain the working fluid at least proximate to the phase transition state while flowing through the internal passage (Where 50 can reduce liquid flow such that the working fluid remains proximate to the phase transition state); and moving at least a portion of the cooled air across the heat generating object (2a) to transfer heat to the air (See POA Fig 1 above). Miller fails to specifically teach or suggest that the working fluid changes phase within the first (l b) and second (l b) heat exchangers - rather Miller teaches a secondary cooling loop (See Fig 5) which provides cooling fluid to the heat exchangers. However, James teaches the conventionality of using a conventional refrigeration loop system which has a controller (That which controls the inlet valve (27a), expansion valve (26), and compressor (23)) such that it maintains the working fluid in a phase transition within the first heat exchanger (Col 7, Lines 9-14). Therefore It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of James as per above with that of Miller with the benefit being that James only uses a single refrigeration circuit (Col 3, Lines 5-9). Using a single refrigeration circuit reduces parts and maintenance. Additionally, the Examiner notes that both the system of Miller (where cooling is tapped from a main refrigeration circuit) and James are well known in the art and interchangeable.

With respect to claim 60, Miller further teaches that the heat generating object is a first computer module, and wherein the method further comprises, after moving the portion of air across the computer module, moving the portion of air past a second heat exchanger (another of l b) in the chassis to transfer heat from the portion of air (See POA Fig 1 above). With respect to claim 61, Miller further teaches that controlling the working fluid to maintain the working fluid at least proximate to the phase transition state includes controlling the pressure of the working fluid (Where 50, a pump, controls the working fluid and the pump controls the pressure of the working fluid) With respect to claims 74-75, 77 Miller further teaches that a control strategy of the controller (50) is controlling the static pressure of the working fluid.

> ***With respect to claim 78, Miller further teaches that controlling the working fluid to maintain the working fluid at least proximate to the phase transition state includes controlling the temperature of the working fluid (Wherein the temperature is controlled via the pump (50) since the speed of the fluid moving through the loop (47) and Pipes (P) is will dictate the temperature of the fluid).***

As indicated above, claim set 57 (claims 57-61, 77, 78) has been canceled without prejudice.

> ***With respect to method claim 79, the method steps recited in the claims are inherently necessitated by the device structure as taught by the Miller and James references.***

For at least the reasons presented above for claim 26 above, independent method claim 79 is likewise patentable over each of Miller, James and their combination. Reconsideration is respectfully requested.

> ***With respect to claims 80 and 81, Miller further suggests that controlling the working fluid does not cause the temperature of the air-to-fluid heat exchanger to drop below the dew point or to allow condensation to form on the air-to-fluid heat exchanger or on the electronic component (Col 2, Lines 51 - 58,-wherein Miller clearly contemplates the issue of condensation on the heat exchanger/units and in Col 2, Lines 54-58 seeks to solve the problem in the present invention which would include controlling the working fluid to remain below the dew point).***
>
> ***With respect to claim 82, Miller further teaches that controlling the working fluid includes controlling the static pressure (Via 46 and 45) of the working fluid or subcooling the working fluid or increasing the condensing capacity of the external heat exchanger.***
>
> ***With respect to claim 83, Miller further teaches that the external heat exchanger (40) is a fluid-to-fluid heat exchanger***

> ***and the working fluid is cooled with chilled water (Col 10, Lines 33-38 -wherein, in view of Fig 5, a 40 being a part of the air conditioning system in a building suggests that chilled water will be used to cool the working fluid).***
>
> ***With respect to claim 84, Miller further teaches a plurality of electronic components (Within 2a, see Fig 2a which shows multiple housings 2a with electronic components) and a plurality of air-to-fluid heat exchangers (1b).***

For at least the reasons presented above with respect to independent claim 79, dependent claims 80 – 84 are likewise allowable.

> ***With respect to claims 8 and 9, Miller in view of James teaches the limitations of claim 1 as per above but is silent as to the airflow path and arrangement of the heat exchangers/computer module compartments being substantially vertically arranged vertically one on top of the other. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to re-arrange the heat exchangers and computer compartments as in Fig 2a (essentially rotate the invention in Fig 2a 90 degrees counter-clockwise) since it has been held that rearranging parts of an invention involves only routine skill in the art, In re Japikse, 86 USPQ 70.***
>
> ***With respect to claim 10, Miller further teaches that the first computer module compartment (Between respective I b) is configured to hold at least a first computer module (2a) oriented edgewise with respect to the air flow path (See Fig 2a).***
>
> ***With respect to claim 11, Miller further teaches that the first computer module compartment (Between respective I b) is configured to hold a plurality of computer modules (2a) oriented edgewise with respect to the air flow path (See Fig 2a).***

Claims 8, 9, 10 and 11 have been canceled without prejudice.

> ***With respect to claim 34, Miller teaches the limitations of claim 33 above and further teaches that the air movers move air horizontally through the chassis but is silent as to the vertical configuration of the chassis with the air mover being positioned toward the top of the chassis to move air up through the chassis, however it would have been obvious to one of ordinary skill in the art at the time the invention was made to rearrange the chassis 90 degrees such that the heat exchangers 1b are arranged vertically since it has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70. In the present case one would be motivated to arrange the system in any fashion (including vertically) in order for the system to fit the dimensions of a given area.***

For at least the reason presented above with respect to independent claim 26, dependent claim 34 is likewise allowable.

> ***With respect to claims 22-23, James further teaches that the working fluid (refrigerant) is carried by the internal fluid passages of the first and second heat exchangers, and wherein a first portion of the working fluid is in a liquid state (i.e. in the condenser 24) and a second portion of the working fluid is in a gaseous state in the heat exchangers (i.e. in the portion between the evaporator and the compressor).***
>
> ***With respect to claims 51 and 72, the method steps recited in the claims are inherently necessitated by the device structure as taught by the Miller and James references in claim 1 above.***
>
> ***With respect to claims 73 and 76, James further teaches controlling the working fluid via static pressure of the working fluid (created by the compressor 23).***

Claims 22-23, 51, 72, 73 and 76 have been canceled without prejudice.

> ***5. Claims 4, 19, 27,42, 52, 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller in view of James and further in view of Salt (US 5,603,375).***
>
> ***With respect to claims 4, 27, and 42, Miller in view of James teaches the limitations of claims 1 and 26 above but is silent as to the working fluid has a boiling point in the first heat exchanger between about 45F and about 75F. Salt teaches utilizing a working fluid which has a boiling point in a heat exchanger of between about 45F and 75F (Column 2, Lines 1-5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Salt with that of Miller and James to provide adequate heat transfer capabilities.***

Claim 4 has been canceled without prejudice. For at least the reasons presented above for independent claim 26, claims 27 and 42 are likewise allowable. Further, Assignee contends that combing Salt with the unworkable combination of Miller and James will not create a working combination.

> ***With respect to claim 19, Miller further teaches that the heat exchanger (1b) is a first heat exchanger, and wherein the computer system further comprises: a third computer module compartment (Between respective element 1b) positioned in the air flow path in the chassis; and a third heat exchanger (1b) positioned at least partially between the second and third computer module compartments in the air flow path in the chassis, the second heat exchanger (1b) including at least one internal fluid passage (Pipes, P) configured to carry the working fluid (Column 10, Lines 59-63).***
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> ***With respect to claim 52, Miller in view of James teaches the limitations of claim 51 as per above, however James is silent as to the working fluid having a boiling point between about 45 and 75F. Salt teaches utilizing a working fluid which has a boiling point in a heat exchanger of between about 45F and 75F (Column 2, Lines 1-5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Salt with that of Miller to provide adequate heat transfer capabilities.***
>
> ***With respect to claim 58, Miller in view of James teaches the limitations of claim 57 as per above, however James is silent***

> ***as to the working fluid having a boiling point between about 45 and 75F. Salt teaches utilizing a working fluid which has a boiling point in a heat exchanger of between about 45F and 75F (Column 2, Lines 1-5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Salt with that of Miller to provide adequate heat transfer capabilities.***

Claims 19, 52 and 58 have been canceled without prejudice.

> ***6. Claims 24, 53 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller in view of James and further in view of Iizuka et al. (US 6,258,293 - hereinafter, "Iizuka").***
>
> ***With respect to claim 24, Miller in view of James teaches the limitations of claim 23 above but is silent as to the working fluid having a boiling point in the first heat exchanger between about 50F and about 65F. Iizuka teaches the conventionality of using a refrigerant having a boiling point between 50 and 65F (Column 11, Lines 10-1 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Iizuka with that of Miller and James to provide adequate heat transfer capabilities.***
>
> ***With respect to claim 53, Miller in view of James teaches the limitations of claims 51 and 57 above but is silent as to the working fluid has a boiling point in the first heat exchanger between about 50F and about 65F. Iizuka teaches the conventionality of using a refrigerant having a boiling point between 50 and 65F (Column 11, Lines 10-1 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Iizuka with that of Miller and James to provide adequate heat transfer capabilities.***
>
> ***With respect to claim 59, Miller teaches the limitations of claim 57 as per above but is silent as to the working fluid has a boiling point in the first heat exchanger between about 50F and about 65F. Iizuka teaches the conventionality of using a refrigerant having a boiling point between 50 and 65F (Column 11, Lines 10-11). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Iizuka with that of Miller and James to provide adequate heat transfer capabilities.***

Claims 24, 53 and 59 have been canceled without prejudice.

> ***7. Petition to Correct Inventorship***
> ***The Examiner acknowledges the petition filed 12/10/2007. A PTO 90(C) form with the Supervisory Examiner's signature indicating whether the petition is granted or denied will accompany this action.***

Assignee confirms that the petition to correct inventorship has been granted.

> ***9. With respect to the Applicants' remarks to claim 26 that, "James does not disclose controlling the temperature or pressure of his working fluid", the Examiner respectfully disagrees. James clearly teaches a conventional cooling cycle whereby a refrigerant is compressed via a compressor, cooled, subsequently expanded (via the expansion valve) and evaporated (in the evaporator) back into a gas. In such a cycle any valves/compressors play an integral role in controlling the temperature and pressure of the working fluid. Indeed, James system is setup so that the working fluid evaporates (changes phase) in the evaporator/heat exchanger and thus provides cooling.***

Assignee disagrees with the Office's factual conclusions on at least two levels. First, the Office's reliance on James to reject independent claims 26 and 79 was based solely on James disclosure and teaching of James' ***unpowered*** cooling cycle, which, by definition does not utilize a compressor (which obviously requires power). As argued above, James has absolutely no teaching or suggestion that the ***unpowered*** cooling cycle is configured to ***control the temperature of the working fluid***. In fact James teaches that the only "control" of the unpowered cycle is by the natural laws of thermodynamics, which dictated when the system reaches temperature equilibrium no further cooling (or phase changes) takes place. That does not teach the claimed "control."

Second, to the extent the Office intended to rely on James' ***powered*** cooling cycle, Assignee agrees that it appears to be a conventional vapor compression cycle using a two-

phase refrigerant with a vapor compressor on the upstream side of the condenser. However, it is well understood that a conventional vapor compression cooling cycle requires an expansion device (James 26) upstream of the evaporator to flash the liquid refrigerant to its gas phase, thereby transferring heat (usually from air) to the refrigerant. The low pressure gas exiting the evaporator is compressed to a high pressure gas by the compressor (James 23). Vapor or gas compressors are well known to be intolerant of liquid phase in the fluid being compressed. Thus, conventional vapor compression cycles like James are designed to have substantially no liquid entering the compressor. Once the gas refrigerant has been compressed, the high pressure gas is condensed to a high pressure liquid in a condenser (James 24), which is then routed back to the expansion device (James 26). See James Fig. 1 and associated text.

In contrast, the inventions of claims 26 and 79 are not vapor compression cycles. Both claims 26 and 79 require only that at least a portion of the working fluid change phase in the first heat exchanger (e.g., evaporator). In other words, rather than flashing all of the working fluid into gas through an expansion device as required by a vapor compression system, in the invention of claims 26 and 79, only that amount of working fluid gas is created in the first heat exchanger as is required to cool the air within the enclosure. That is, the working fluid exiting the first heat exchanger may be 100% gas or any mixture of liquid and gas. Neither claim 26 nor claim 79 require that the working fluid exiting the first heat exchanger be 100% vapor or that any working fluid vapor be compressed. Any vapor or gas exiting the first heat exchanger is condensed, not compressed. In the same vein, both claims require a pump (in contrast to a compressor) ***downstream*** of the external heat exchanger (e.g., condenser). James does not teach or suggest a pump in such configuration.

Thus, because James uses a conventional vapor compression cycle, he does not and cannot teach that the fluid exiting the evaporator can contain a liquid phase or that a pump can

be placed downstream of the external heat exchanger. Nor does James disclose or teach controlling the ***temperature*** of the working fluid that is supplied to the heat exchanger in a non-vapor compression cycle.

5. Conclusion

In responding to this Office Action, Assignee has presented only those arguments and made only those amendments that Assignee believes are warranted. Assignee has not, for example, responded to every factual or legal issue raised by the Office, and Assignee has not presented every argument supporting patentability that may be relevant to the rejected claims. The decision to not address a factual or legal issue raised or to present a certain argument in support shall not be construed as Assignee's agreement with the Office on such issue or effect a waiver of Assignee's right to address such issues or make such arguments in the future.

Assignee thanks the Examiner for his consideration and effort on this file. If there are any questions or if additional information is needed, the Examiner is invited to telephone or email the undersigned.

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APPENDIX

26. (Clean) A system comprising:

an enclosure having a chassis therein and adapted to operatively house heat-producing electronic equipment and defining an air flow path into the enclosure, across the electronic equipment and out of the enclosure;

a first heat exchanger positioned in the enclosure and in the air flow path, and comprising a plurality of cooling fins, each having a fluid passage therein;

a working fluid configured to change state from a first phase to a second phase within at least one of the fluid passages in response to heat in the air flow path;

a heat exchanger positioned externally to and spaced apart from the enclosure and in fluid communication with the first heat exchanger, wherein the external heat exchanger is configured to change the state of the working fluid from the second phase to the first phase;

a pump located downstream of the external heat exchanger and configured to circulate the working fluid in the first phase to the first heat exchanger; and

a controller operably coupled to the system and configured to control the temperature of the working fluid supplied to the first heat exchanger above a dew point of the air in the air flow path.

27. (Clean) The system of claim 26, wherein the working fluid has a boiling point in the first heat exchanger between about 45° F. and about 75° F.

28. (Clean) The system of claim 26, further comprising a plurality of computer modules held in a first electronics compartment.

29. (Clean) The system of claim 28, further comprising a second electronics compartment positioned in the chassis and in the air flow path wherein the first heat exchanger is positioned at least partially between the first and second electronics compartments.

32. (Clean) The system of claim 26 wherein the chassis is partitioned into a plurality of electronics compartments and each is configured to hold a plurality of computer modules oriented edgewise with respect to the air flow path.

33. (Clean) The system of claim 32, further comprising:

an air mover associated with the enclosure;

a first plurality of computer modules held in a first electronics compartment at least partially in the air flow path;

a second electronics compartment positioned in the air flow path in the chassis and spaced apart from the first electronics compartment;

a second plurality of computer modules held in the second electronics compartment at least partially in the air flow path; and

a second air-to-fluid heat exchanger positioned in the air flow path in the chassis, wherein the second heat exchanger is positioned at least partially downstream of the first electronics compartment and at least partially upstream of the second electronics compartment, and wherein the second heat exchanger includes at least one opening through which the air mover moves air to transfer heat from the air to the fluid.

34. (Clean) The system of claim 33 wherein the air mover is positioned toward an upper portion of the chassis and configured to draw air upward through the chassis and past the first electronics compartment, the first and second heat exchanger, and the second electronics compartment.

35. (Withdrawn – Clean) The system of claim 33 wherein the air mover is positioned toward a bottom portion of the chassis and configured to drive air through the chassis and past the first electronics compartment, the heat exchanger, and the second electronics compartment.

36. (Clean) The system of claim 33 wherein the air mover is carried by the chassis.

37. (Clean) The system of claim 33 further comprising:

a third electronics compartment positioned in the air flow path in the chassis and spaced apart from the second electronics compartment;

a third plurality of computer modules held in the third electronics compartment at least partially in the air flow path; and

a third heat exchanger positioned in the air flow path in the chassis, wherein the third heat exchanger is positioned at least partially downstream of the second electronics compartment and at least partially upstream of the third electronics compartment, and wherein the third heat exchanger includes at least one opening through which the air mover moves air.

38. (Clean) The system of claim 33 wherein the air mover, the electronics compartments, and the heat exchangers are arranged vertically with respect to the chassis.

39. (Clean) The system of claim 33 wherein the first electronics compartment is configured to hold the first plurality of computer modules in edgewise orientation with respect to the air flow path toward a first side of the first heat exchanger, and wherein the second electronics compartment is configured to hold the second plurality of computer modules in an edgewise orientation with respect to the air flow path from a second side of the first heat exchanger opposite to the first side of the first heat exchanger.

40. (Clean) The system of claim 33 wherein each of the first plurality of computer modules is individually carried by the first electronics compartment, wherein each of the first plurality of computer modules includes at least a first computer processor, wherein each of the second plurality of computer modules is individually carried by the second electronics compartment, and wherein each of the second plurality of computer modules includes at least a second computer processor.

42. (Clean) The system of claim 33 wherein working fluid has a boiling point in the heat exchangers between about 45° F. and about 75° F.

43. (Clean) The system of claim 33 wherein each computer module of the first and second pluralities of computer modules includes at least one processor.

75. (Clean) The system of claim 26, wherein a control strategy of the controller is selected from the group consisting of: controlling the static pressure of the working fluid; subcooling the working fluid; increasing the heat transfer capacity of the external heat exchanger; and any combination thereof.

79. (Clean) A method for cooling an electronic component housed in a cabinet, comprising:

providing the cabinet with an air inlet and an air outlet defining an air flow path therebetween;

locating an air-to-fluid heat exchanger within the cabinet and within the air flow path;

providing a heat exchanger external to and spaced from the cabinet;

locating a working fluid pump between the air-to-fluid heat exchanger and the external heat exchanger and downstream of the external heat exchanger;

circulating a working fluid through the air-to-fluid heat exchanger and the external heat exchanger, the working fluid configured to change state from a first phase to a second phase within the air-to-fluid heat exchanger;

changing the state of at least a portion of the working fluid from the first phase to the second phase in the air-to-fluid heat exchanger in response to heat in the air flow path;

removing heat from the working fluid in the external heat exchanger;

changing the state of the working fluid from the second phase to the first phase in the external heat exchanger in response to removing heat therefrom; and

controlling the heat removal so that a temperature of the working fluid circulated to the air-to-fluid heat exchanger is above a dew point of the air in the air flow path.

80. (Clean) The method of claim 79, wherein controlling the working fluid does not cause the temperature of the air-to-fluid heat exchanger to drop below the dew point.

81. (Clean) The method of claim 79, wherein controlling the working fluid does not cause condensation to form on the air-to-fluid heat exchanger or on the electronic component.

82. (Clean) The method of claim 79, wherein controlling the working fluid includes controlling the static pressure of the working fluid or subcooling the working fluid or increasing the condensing capacity of the external heat exchanger.

83. (Clean) The method of claim 79, wherein the external heat exchanger is a fluid-to-fluid heat exchanger and is cooled with chilled water.

84. (Clean) The method of claim 79, further comprising a plurality of electronic components and a plurality of air-to-fluid heat exchangers.